



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/643,136	08/18/2003	Mark Kleshock	TAZ-237	3298

37694 7590 04/18/2006

WOOD, HERRON & EVANS, LLP (TOKYO ELECTRON)
2700 CAREW TOWER
441 VINE STREET
CINCINNATI, OH 45202

EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT PAPER NUMBER

1763

DATE MAILED: 04/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/643,136

Applicant(s)

KLESHOCK ET AL.

Examiner

Rakesh K. Dhingra

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/17/06.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13,36-51 and 63 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13,36-51 and 63 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 36-51 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 36 to add new limitations and made claim 1 dependent upon claim 36. Additionally minor amendments have been made to dependent claims and new claim 63 has been added.

Examiner has found new references by Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PG PUB No. 2004/0094402) and Miller et al (US Patent No. 6,627,050) that when combined read on independent claim 36. Accordingly independent claim 36 has been rejected under 35 USC 103 (a) as explained below. Remaining claims (claim 6 and dependent claims 37-51, 1-5, 7-13 and new claim 63) have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under

Art Unit: 1763

37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 36, 37, 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PG PUB No. 2004/0094402) and Miller et al (US Patent No. 6,627,050).

Regarding Claims 36,63: Drewery et al teach an ionized physical vapor deposition (IPVD) apparatus (Figures 1, 22) that includes a vacuum chamber 501 with an IPVD source 503 and shield assembly 495. Drewery et al also teach that chamber is cooled and is made of stainless steel (normally grounded) [column 6, lines 35-55 and column 14, line 25 to column 15, line 20].

Drewery et al do not teach an upper source shield (and its shape features) configured to surround a material source and energy source in a removable top portion of a cooled and grounded chamber wall of a semiconductor processing apparatus for protecting said top portion from deposition.

Gopalraja et al teach a sputtering apparatus (Figures 4, 7) that includes a vacuum chamber 142 with a PVD target 146 and a shield 164 (upper source shield) that surrounds material and energy source 232 and protects top portion of chamber wall 142 from sputter deposition. Gopalraja et al further teach (without explicitly naming the individual surfaces) that upper source shield 164 comprises (per Figure 7) an annular

Art Unit: 1763

shape and includes a head (like top ring) 255, a sloped ring, a bottom ring and mounting element, wherein:

the top ring comprises inner surface, top surface, and an outer surface;

the sloped ring comprises an inner surface coupled to the inner surface of the top ring;

the bottom ring comprises an inner surface coupled to the inner surface of the sloped ring, an outer surface coupled to the outer surface of sloped ring,

and a bottom surface coupled to the inner surface and the outer surface;

and, the flange (mounting element) 251 of upper shield 164 contacts shield 166 (through shield isolator 168), and that both shields could also be grounded, and form intimate thermal contact and electrical contact with the chamber wall (Figure 7 and paragraphs 0038, 0047, 0060–0063).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a upper source shield in the apparatus of Drewery et al as taught by Gopalraja et al to prevent build-up of deposition (in conjunction with chamber shield) on the chamber wall (paragraphs 0047, 0067, 0068).

Drewery et al in view of Gopalraja et al do not teach that an outer surface of sloped ring is coupled to the outer surface of the top ring and mounting element comprises a mating surface coupled to the outer surface of the sloped ring and at least one other surface coupled to the top surface and the outer surface of bottom ring.

Miller et al teach a sputter apparatus (Figures 2, 3A, 3B) that comprises an upper shield 64 that fills the space between target 5 and upper edge of inner shield 66. Miller et al

Art Unit: 1763

also teach that shape of upper shield could be selected/changed based upon process limitations (column 4, line 30 to column 5, line 25).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to select shape of upper source shield (includes sloped ring and mounting element) as taught by Miller et al in the apparatus of Drewery et al in view of Gopalraja et al, as per process limitations.

Regarding Claim 37: Gopalraja et al teach that shield 164 is made from stainless steel. Further as per drawing of the shield it can be manufactured from a single block of material (Paragraph 0067).

Claims 38, 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402) and Miller et al (US Patent No. 6,627,050) as applied to Claim 37 and further in view of Lawson et al (US PGPub. No. 2004/0020759).

Regarding Claims 38, 49: Drewery et al in view of Gopalraja et al and Miller et al teach all limitations of the claim including that inner sides of shield may be roughened or bead-blasted to promote adhesion.

Drewery et al in view of Gopalraja et al do not teach roughening of outer surfaces and the shield material.

Lawson et al teach an apparatus (Figures 2, 2a) that has a chamber 18 with shields 40, 40a, which are made from Aluminum 6061-T6. Lawson et al also teach that surfaces of shields that come in line-of-sight of the target are abrasive (grit) blasted to ensure that

Art Unit: 1763

that deposits that occur on these surfaces are less likely to flake-off during processing (Paragraph 0053).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use shield made from Aluminum 6061-T6 as taught by Lawson et al in the apparatus of Drewery et al in view of Gopalraja et al and Miller et al prevent deposition of coating material on cathode assembly (Paragraph 0017).

Claims 39-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402) and Miller et al (US Patent No. 6,627,050) as applied to Claim 36 and further in view of Tepman (US Patent No. 5,951,775) and Eckerson (US PGPub. No. 2004/0245098).

Regarding Claim 40: Drewery et al in view of Gopalraja et al and Miller et al teach all limitations of the claims except for shape and dimensions of the upper source shield. Tepman et al teach an apparatus (Figure 2) that has a sputter chamber 2 with a deposition shield 10 that has a mounting portion (mounting element) 11 comprising a plurality of holes (using screws 12) extending from mating surface to bottom surface (Column 3, lines 6-20).

Though Tepman does not teach size of hole but he teaches that configuration of shield conforms to internal shape of chamber (Abstract).

Further Eckerson teach an apparatus (Figures 1-3) that has a processing chamber 110 and has shield 152. Eckerson also teaches that dimensions of shields are materially linked with the processes performed in the chamber (Paragraph 0005).

Art Unit: 1763

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use upper shield shape and configuration as taught by Tepman and Eckerson in the apparatus of Drewery et al in view of Gopalraja et al and Miller et al to eliminate build-up of deposits as per process performed and also to enable easy removability of the shield.

Further it has been held in courts (Case law):

“It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).”

“It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).”

“Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).”

Regarding Claims 39, 41-48: Drewery et al in view of Gopalraja et al, Miller et al, Tepman and Eckerson teach all limitations of the claims as explained above.

Claims 50, 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402) and Miller et al (US Patent No. 6,627,050) as applied to claim 37 and further in view of Nishimoto et al (US PGPub. No. 2004/0173155).

Regarding Claims 50,51: Drewery et al in view of Gopalraja et al and Miller et al teach all limitations of the claim except coating on upper source shield surfaces.

Art Unit: 1763

Nishimoto et al teach an apparatus (Figure 1) that has a plasma chamber 10 with deposition shield 18 whose exposed surfaces (exposed to deposition) are given protective barrier coating of Yttria by spray coating techniques (Paragraphs 0049-0051). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to give protective coating on shield as taught by Nishimoto et al in the apparatus of Drewery et al in view of Gopalraja et al and Miller et al to improve durability of the exposed surfaces.

Claim 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PG PUB No. 2004/0094402) and Miller et al (US Patent No. 6,627,050) as applied to Claim 36 and further in view of Gung et al (US PG PUB No. 2005/0199491).

Regarding Claims 1-3: Drewery et al in view of Gopalraja et al and Miller et al teach all limitations of the claim as explained above, except mounting surface having sufficient area to provide high thermal conductivity between shield and chamber walls.

Gung et al teach an apparatus (Figures 9,11,12) that has a chamber shield assembly (162, 200) for a semiconductor-wafer vacuum processing apparatus comprising: a plurality of shields (162, 200) made of high thermal conductivity material (Aluminum) to provide high thermal conductivity throughout each shield, each shield having a mounting surface (168, 202) configured to provide intimate thermal contact with the wall of a chamber (through a large number of holes 180) of the apparatus when secured thereto, the mounting surface having sufficient area to provide

Art Unit: 1763

high thermal conductivity between the shield and the wall of the chamber (Paragraphs 0050 –0053, 0057).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use shield configuration as taught by Nishikawa et al in the apparatus of Drewery et al in view of Gopalraja et al and Miller et al to provide large area for securing the shield and also for high thermal contact (shield being of aluminum) between shield and chamber wall.

Regarding Claims 4, 5: Drewery et al teach (Figure 22) that shields 136, 137 are configured to mount in a cooperating relationship and that the shields float mechanically relative to each other and gaps are dimensioned to accommodate different thermal expansion due to different heating (Paragraphs 0020, 0096, 0097).

Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402), Miller et al (US Patent No. 6,627,050), Gung et al (US PGPub. No. 2005/0199491) and Gopalraja et al (US PGPub. No. 2004/0140196).

Regarding Claim 6: Drewery et al in view of Gopalraja et al ('402), Miller et al and Gung et al teach all limitations of the claim (as explained above) except chamber with temperature controlled walls.

Gopalraja et al ('196) teach an apparatus (Figure 3A) that has a chamber 106 with a shield 128 to protect the wall from sputtered material and where the temperature of chamber wall is controlled by temperature control instruction set 348 and a controller 303 (Paragraphs 0031, 0047).

Art Unit: 1763

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use vacuum chamber with shield and having temperature controlled wall as taught by Gopalraja et al ('196) in the apparatus of Drewery et al in view of Gopalraja et al ('402), Miller et al and Gung et al to provide better control of sputtering process.

Regarding Claims 7, 8: Drewery et al in view of Gopalraja et al ('402), Miller et al and Gung et al, and Gopalraja et al ('196) teach all limitations of the claims as explained above.

Regarding Claims 9-11: Drewery et al in view of Gopalraja et al ('402), Miller et al, Gung et al and Gopalraja et al ('196) teach all limitations of the claims as explained above.

Claims 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402), Miller et al (US Patent No. 6,627,050), Gung et al (US PGPub. No. 2005/0199491) and Gopalraja et al (US PGPub. No. 2004/0140196) as applied to Claim 6 and further in view of Hosokawa et al (US Patent No. 5,518,593).

Regarding Claim 12: Drewery et al in view of Gopalraja et al ('402), Miller et al, Gung et al and Gopalraja et al ('196) teach all limitations of the claim except radiant heaters to heat the shield.

Hosokawa et al teach an apparatus (Figures 17,18) that has a shield assembly 46 and radiant heaters 76-79 for heating the shields (Column 10, line 60 to Column 11, line 20).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use radiant heaters for chamber shield as taught by Hosokawa et al in the

Art Unit: 1763

apparatus of Drewery et al in view of Gopalraja et al ('402), Miller et al, Gung et al and Gopalraja et al ('196) to enable eliminate detrimental stresses in the sputter deposited material (Column 3, line 60 to Column 4, line 5).

Claims 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Drewery et al (US Patent No. 6,287,435) in view of Gopalraja et al (US PGPub No. 2004/0094402), Miller et al (US Patent No. 6,627,050), Gung et al (US PGPub. No. 2005/0199491) and Gopalraja et al (US PGPub. No. 2004/0140196) as applied to Claim 6 and further in view of Stevens et al (US PGPub. No. 2005/0199489).

Regarding Claim 13: Drewery et al in view of Gopalraja et al ('402), Miller et al, Gung et al and Gopalraja et al ('196) teach all limitations of the claim except radiant lamps to heat the shield.

Stevens et al teach an apparatus (Figure 5) that has a chamber 102, with a shield 138 that is heated by radiant lamps 138b installed around the chamber and oriented parallel to chamber axis (Paragraphs 0070, 0071).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use radiant lamps for heating the shield as taught by Stevens et al in the apparatus of Drewery et al in view of Gopalraja et al ('402), Miller et al, Gung et al and Gopalraja et al ('196) to minimize peeling-off of the sputtered material from the surface of the shield.

Conclusion

Art Unit: 1763

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1763

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763